

REPLACEMENT AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A virtual protection method for a fiber path in a network having more than one node , comprising:

dividing resources of each optical port ~~[[of]]~~by each of the nodes in the fiber path into multiple minimum protection units;

defining a plurality of logic-systems in the network, each of the logic systems including a physical media and carrying services, the physical media including nodes and fiber connecting those nodes;

mapping more than one of the minimum protection units by each of the node into different ones of the plurality of logic-systems, each of the plurality of logic-systems including two minimum protection units of at least one of the nodes; wherein a first logic-system of the plurality of logic-systems respectively adopts a first protection mode of multiplex section protection, path protection or sub-network connection protection; a second logic-system of the plurality of logic-systems adopts a second protection mode of multiplex section protection, path protection or sub-network connection protection; and

determining, where protection for the services carried by a first-logic-system which adopts a protection mode of multiplex section protection~~of the plurality of the logic-systems~~ is needed, a working mode ~~of a node~~by each of the nodes, belonging to the first logic-

system; the working mode including normal working mode, passing working mode, bridging working mode and switching working mode; wherein

in the passing working mode, connecting an input protection bus of a given node is connected to an output protection bus of that node;

in the bridging working mode, connecting the input protection bus of that node is connected to the an output working bus of that node; and

in the switching working mode, the-connecting an input working bus of that node is connected to the output protection bus of that node;

in the normal working mode, connecting the input working bus of that node to the output working bus of that node;

wherein protection for the services carried by a given logic-system which adopts a path protection is needed, performing a path protection by each of the nodes belonging to that given logic-system;

wherein protection for the services carried by a given logic-system which adopts a sub-network connection protection is needed, performing a sub-network connection protection by each of the nodes belonging to that given logic-system.

2. (Canceled).

3. (Previously Presented) The method according to claim 1, further comprising:
obtaining four sets of pages: working pages, switching pages, bridging pages and passing pages by analyzing current configuration; and

after determining the working mode of the node belonging to the first logic-system, sending down a passing page to that node if that node is in the passing working mode, sending down a bridging page to that node if that node is in the bridging working mode, sending down a switching page to that node if that node is in the switching working mode, or sending down working pages to that node if that node is in the normal working mode.

4. (Canceled).

5. (Previously Presented) The method according to claim 1, wherein the minimum protection unit is a VC4 or a VC3.

6. (Canceled).

7. (Previously Presented) The method according to claim 1, further comprising: adjusting and crossing services which are sent to the same minimum protection unit from different minimum protection units by a time-division cross-connect unit in the transmission system.

8. (Currently Amended) A virtual protection device for a fiber path in a network having more than one node, comprising:

a first component configured to

divide resources of each optical port of each node in the fiber path into multiple minimum protection units ~~individually~~;

define a plurality of logic-systems in ~~[[a]]the~~ network, ~~wherein~~ each of the logic system ~~defines including a~~ physical media and carrying services, the physical media including nodes and fiber connecting ~~these the~~ nodes; and

map more than one of the minimum protection units into different ones of the plurality of logic-systems, ~~wherein~~ each of the plurality of logic-systems including at least two minimum protection units of at least one of the nodes; wherein a first logic-system of the plurality of logic-systems respectively adopts a first protection mode of multiplex section protection, path protection or sub-network connection protection; a second logic-system of the plurality of logic-systems adopts a second protection mode of multiplex section protection, path protection or sub-network connection protection;

a paging analyzer configured to analyze configuration of the plurality of logic-systems, creating corresponding working pages and storing the working pages in a switching controller;

wherein the switching controller is configured to send down corresponding working pages to a cross-connection panel according to switching state; and

wherein the cross-connection panel is configured to connect an input protection bus to an output protection bus if a passing working page is sent down, or, connect the input protection bus to an output working bus if a bridging working page is sent down, or,

connect ~~the~~an input working bus to ~~an~~the output protection bus if a switching working page is sent down;

a second component configured to perform a path protection by each of the nodes belonging to a logic-system which adopts a path protection, where protection for the services carried by the logic-system is needed;

a third component configured to perform a path protection by each of the nodes belonging to a logic-system which adopts a sub-network connection protection, where protection for the services carried by the logic-system is needed.

9. (Original) The device according to claim 8, wherein the working pages are normal working pages, or passing pages, or bridging pages, or switching pages.

10-11. (Canceled).

12. (New) A virtual protection method for a fiber path in a network having more than one node, comprising:

assigning each fiber and node in the network to one or more of a plurality of logic-systems in the network based on protection levels and modes;

mapping virtual containers received by a single optical port of a first node in the fiber path to different ones of the plurality logic-systems including mapping a first received virtual container to a first logic-system and a second received virtual container to a second logic-system;

operating the first logic-system and the second logic-system each in a protection mode including

selectively switching, at each node assigned to both the first and second logic-systems, each of the virtual containers mapped to the first or second logic-system and received by a single optical port of that node in accordance with the protection mode of the logic-system to which that received virtual container is mapped, and further including

(a) switching the first received virtual container, at the first node, in accordance with a first one of normal working mode, passing working mode, bridging working mode, and switching working mode and (b) switching the second received virtual container, at the first node, in accordance with a second one, that differs from the first one, of the normal working mode, the passing working mode, the bridging working mode, and the switching working mode;

wherein in the passing working mode of a given node, the given node switches a virtual container received by an input protection bus of the given node to an output protection bus of the given node;

in the bridging working mode of the given node, the given node switches the virtual container received by the input protection bus of the given node to an output working bus of the given node; and

in the switching working mode, the given node switches the virtual container received by an input working bus of the given node to the output protection bus of the given node.

13. (New) The virtual protection method of claim 12, further comprising assigning the each media to the plurality of logic-system based on the network element type, service direction, fiber number, and basic network topology type.

14. (New) A virtual protection method for a fiber path in a network having more than one node, comprising:

assigning each physical media and node in the network to one or more of a plurality of logic-systems based on protection levels and modes;

mapping virtual containers transmitted in the network to different ones of the plurality of logic-systems;

a protection switching controller operating first and second ones of the plurality of logic-systems each in one of multiplex section protection mode, path protection mode, and sub-network connection protection mode, including

instructing a node assigned to both the first logic-system and the second logic-system to selectively switch each of the virtual containers mapped to the first or

second logic-system and received by the node in accordance with the protection mode of the logic-system to which that received virtual container is mapped, and further including

switching, at the node, the virtual containers respectively mapped to the first and second logic-systems in accordance with respective different ones of normal working mode, passing working mode, bridging working mode, and switching working mode;

wherein in the passing working mode, a given node switches a virtual container received by an input protection bus of that node to an output protection bus of that node;

in the bridging working mode, the given node switches the virtual container received by the input protection bus of that node to an output working bus of that node; and

in the switching working mode, the given node switches the virtual container received by an input working bus of that node to the output protection bus of that node.

15. (New) The virtual protection method of claim 14, further comprising receiving and de-multiplexing, at one of the nodes, virtual containers each formed by multiplexing different virtual containers respectively mapped to different logic-systems including at least one of the first and second logic-systems, and

switching the de-multiplexed virtual containers mapped to the first logic-system in accordance with a first one of the working modes and switching the de-multiplexed virtual containers mapped to the second logic-system in accordance with a second one, different from the first one, of the working modes.